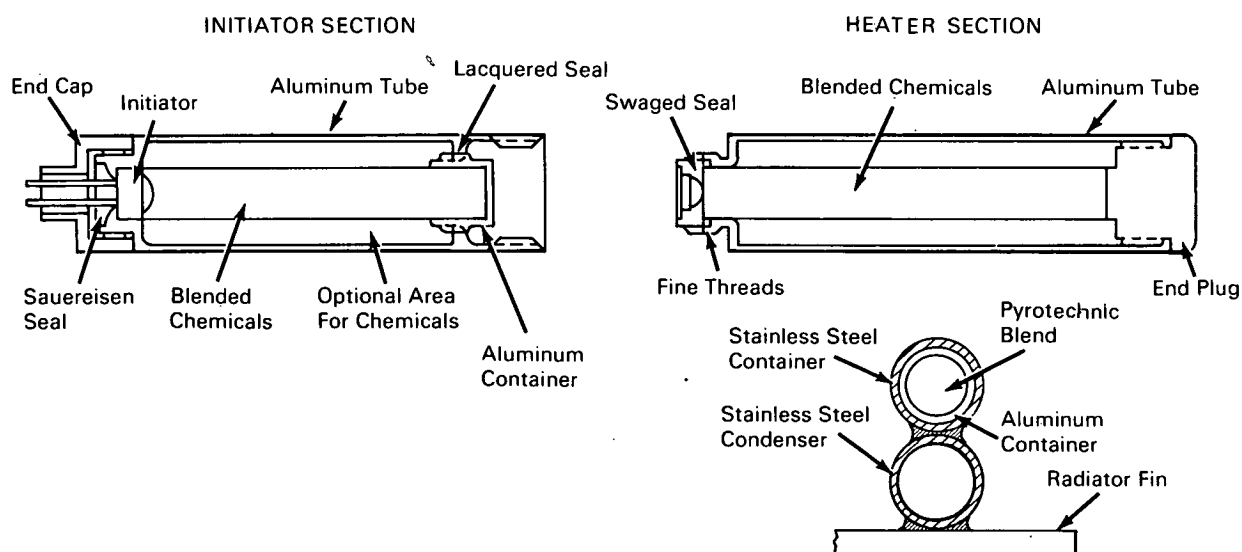


# NASA TECH BRIEF



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## Pyrotechnic Device Provides One-Shot Heat Source



### The problem:

To provide a lightweight, efficient, and dependable one-shot heat source capable of creating a predetermined temperature around sealed packages.

### The solution:

A pyrotechnic heater, composed of a blend of an active chemical element (boron, zirconium, or magnesium) and another compound (molybdenum trioxide, barium chromate, or cupric oxide), which reacts exothermically when ignited and produces fixed quantities of heat. Positive ignition is electrically initiated.

### How it's done:

The pyrotechnic heater consists of two main sections, the initiator section and the heater section. The initiator section is composed of an aluminum tube

fitted with a Sauereisen seal at one end and a lacquered seal at the other. This section contains blended chemicals capable of ignition by an electrical firing network. The lacquered seal end is fitted with an internally threaded aluminum container which fits over the firing end of the heater section.

The heater section is also an aluminum tube, containing a preselected blend of pyrotechnics capable of producing the desired temperature rise time, heating temperature, and burning time. The end which mates with the initiator section has a swaged seal and a narrow threaded neck to fit into the container of the initiator. The other end is fitted with an end plug which will not melt or burn at the heater's operating temperature.

In operation, an electrical impulse ignites the chemical blend of the initiator section. When the flame

(continued overleaf)

front reaches the lacquered seal and the thin aluminum container at the screw thread of the next section, the seal melts and the heater section is ignited. The pyrotechnic blend burns until the flame front reaches the end plug. Several heater sections may be joined to provide for the parameters of burn time and heat required. Physical configuration requirements can be met by bends or angles in any section.

**Notes:**

1. Pyrotechnic heaters are capable of providing 850 to 900 BTU's per pound, while storage-battery-driven heaters can produce only 70 to 120 BTU's per pound. Temperatures of  $600^{\circ} \pm 15^{\circ} \text{F}$  are attainable with a barium pyrotechnic blend.

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B68-10062

**Patent status:**

No patent action is contemplated by NASA.

Source: Vincent R. Lalli and Henry C. Haller  
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